



Department of
Environmental
Conservation

New York HABs Program: In with the old, out with the new

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NJ Water Monitoring Council
September 23, 2015

A short (but long ago) history of HABs in NYS

400 years ago, Samuel Champlain's description of Oneida Lake suggested algae blooms were common on the lake

200 years later, James Fenimore Cooper observed "lake blossoms" on the lake, now described as "blooms"

Similar blooms were documented on a number of the lakes by biologists during the New York Conservation Department Biological Surveys from 1924-1938



Fast forward to “yesterday”

Lake Ontario 2010



Lake Erie 2009



Lake Champlain 2008



Lake algae may be killing animals, birds

Authorities: Don't fish or touch the water. Water samples to be tested.

By Delen Goldberg
Staff writer

A dog climbed out of Lake Neatahwanta in Fulton after a short swim Tuesday night, broke into convulsions and began vomiting.

Within minutes, the Labrador

While the toxin is unlikely to be fatal to humans, officials said high levels of the poison can cause liver and nervous system damage.

“Until we find out for sure what is going on, it’s better that people stay away,” said Evan Walsh, associate public health sanitarian for the county Health Department.

Authorities posted signs Thursday on parts of the lake’s eastern shore warning people to



The Post-Standard

Two DEC biologists wearing



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**Sodus Bay
(Lake Ontario)
2010**



**Song Lake
(Central NY)
2009**



**Cuba Lake
(Western NY)
2010**



**Hedges Lake
(Eastern Adks)
2010**



**Mill Pond
(Long Island)
2008**

2013.... New York is a HABsy state...



10

New York had 50 laboratory confirmed toxic algae warnings, an indication of how a strong monitoring system can reveal the true depth of the problem.



best management practices on their farms that protect water quality.

1 For the first time, **Kentucky** officials found toxic algae this summer at four lakes which collectively serve more than 5 million people a year. Visitors to the lakes have complained of nausea and stomach problems.

2 Toxic algae has become a regular occurrence in **Lake Erie**, due primarily to agricultural runoff. Thick mats of algae have closed beaches, delayed fishing, and diminished outdoor recreation opportunities.

system can reveal the true depth of the problem.

11 In southeast **Florida**, a massive toxic algae outbreak covered St. Lucie River and Indian River Lagoon with fluorescent green slime. The summer prompting warnings from health officials to not touch the water. Scores of dolphins, manatees, birds and fish have died, and thousands of residents have protested, calling for a statewide emergency management plan to stop the toxic slime.

12 A new USGS-funded project in **Alabama** is tracking toxic algae in 300-400 freshwater sites around the southeastern U.S. Most states in the region do not currently monitor HABs.

Toxic Algae: Coming Soon to A Lake Near You? :: 3



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Where are they in NY? 2014 HAB “Season”

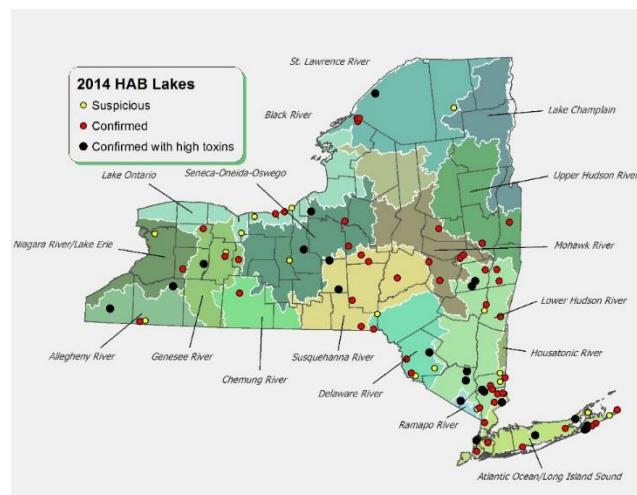
Season = June thru October

93 waterbodies reported blooms

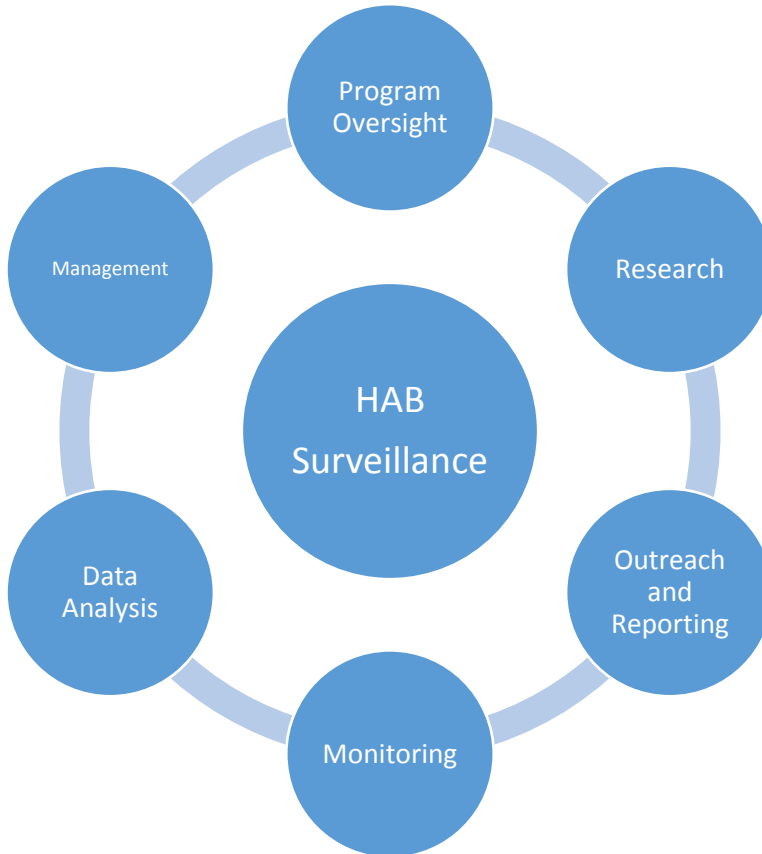
- 74 “confirmed” (out of 195 sampled waterbodies)
- 19 “suspicious”

75 lakes identified through DEC or other baseline monitoring programs

18 lakes identified by public reporting outside of baseline monitoring programs



Elements of the NY HABs Program



Factors that direct the program

Goals

- Protect the public from health risks- worst case scenarios
- Document HAB problems but can't be all places at all times
- Link HABs to chlorophyll a, P, N, other stressors

People

- Limited staff at DEC or DOH to conduct monitoring
- Interested and willing pool of trained volunteers
- Researchers w/ fluoroprobe/scopes, ability to measure toxins
- Engaged public looking for advisory information

Funding

- Limited DEC funds, no DOH funds post CDC study
- Access to supplemental EPA funds
- Volunteers, public, other free stuff



But what about these things (more factors)?

Authority

DOH (OPRHP)--regulated beaches- protocols based on visual only
DEC --all other unregulated sites- outreach driven by data

Timing of reports & data analysis

Weekly (Friday) updates in advance of recreational season
Near real time reporting to partners

Uncertainty

Provide advisories w/o toxins or “best” measures of algae biomass
Balance protection with alarming or desensitizing lake users

Messaging

Recreational users, potable water users, pets, visitors
Distinguishing messages by level of contact and exposure
Balancing use support with use protection

The 3 Ps of surveillance and monitoring

Programs

Citizens Statewide Lake Assessment Program (CSLAP)

Lake Classification and Inventory Survey (LCI)

Partnerships

NY Federation of Lake Associations

Agencies: NYS/County DOH, NYS/NYC Parks

Academic: SUNY ESF and Stony Brook University

Big Lakes: Honeoye Lake, Seneca Lake,

Public

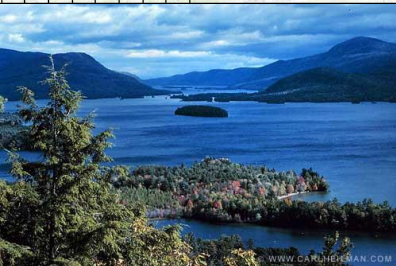
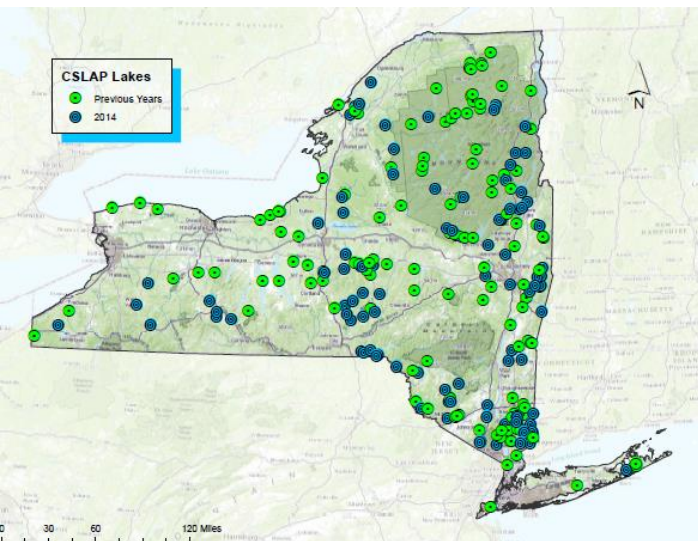


Citizens Statewide Lake Assessment Program (CSLAP)

- State mandated volunteer lake monitoring program (since 1985)
- NYS Federation of Lake Associations (statewide not-for-profit)
- Volunteers trained by DEC and NYSFOLA to collect and process field data
- No lake size limits (<5 to > 28,000 acres)
- Public and private lakes
- ELAP certified analysis



Citizens Statewide Lake Assessment Program (CSLAP)



1986-2015 (continuously):

- >30,000 samples at 250 lakes
- >2000 volunteers
- 2015 – 125 lakes

Program focus on eutrophication

Volunteers sample 8x per year

Analyzed by Upstate Freshwater Institute

Subsidized program:

- State dedicates >\$100k, staff time
- NYSFOLA lake associations contribute appx. \$55k annually (\$375-500 per lake)
- EPA grants for HAB monitoring and surveillance (partnership with SUNY ESF)



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The power of volunteers

- Committed and passionate environmental stewards
- Donate time and money and effort
- Live at lake- responsive to immediate and short-term changes
- Familiar with what is “normal” at their lake
 - Can detect changes in lake condition
 - Can identify when “bloom” occurs
- Environmental data used to manage lake (most lake management in NYS is local)
- Expands data collection throughout the state – beyond Agency survey sites= greater understanding of regional patterns and issues



Open water HAB samples come in two forms

- ❑ 8x per year (biweekly) from near center of lake, grab from 1.5 meters
- ❑ “Raw”: 50 ml whole water sample
 - analyzed for BGA content (BG chl.a) in fluoroprobe
- ❑ Filter: 200ml water sample filtered in the field and filter frozen
 - Analyzed for 26 algal toxins
- ❑ sent to Upstate Freshwater Institute with water chemistry samples
- ❑ transported after screening to ESF



Shoreline Bloom Skim/Scum Samples



CSLAP - Orange Lake Harmful Algal Bloom Sample Data Sheet

Sample ID Number: _____

Date: 5/24/15

Sampler Name: K. M. J. W. S.

Description of bloom (if applicable): _____

WATER TEMPERATURE: _____

How Extensive is the Bloom
(check one):

☐ No bloom present

☐ Small localized (few properties)

☒ Large localized (many properties)

☐ Widespread/lakewide

Map: A map of Orange Lake with various streets labeled (e.g., Rock Cut Rd, Summit Ave, Valley Ave, Smith Ave, Shiner Ave, Spencer Ave, Lakeside Rd, Oakley Dr, Garrison Rd, Black Angus Ct, Jentry Ln, Driveway, Unnamed Street, Rose Estate, Baird, Rock Cut, Thine St, Valley Ave, Smith Ave, Shiner Ave, Spencer Ave, Lakeside Rd, Oakley Dr, Garrison Rd, Black Angus Ct, Jentry Ln, Driveway, Unnamed Street). A box labeled 'Arrow Showing Wind Direction' contains the text 'CALM'. A box labeled 'Mark with an X where any bloom samples were collected' contains a map with an 'X' marked at a location labeled 'C'.

Do not collect sample

Example: A map showing a lake with a box labeled 'C' and an 'X' marked at a location labeled 'C'.

G. Duckweed or watermeal

H. Other

I. No evidence of bloom

Collect sample

A. Spind paint appearance on surface

B. Pea soup appearance within the water

C. Strands (usually green) on the water

D. Green dots or clumps on/in the water

E. Bubbling scums on the lake surface

F. Slight greenish or brownish tint to the water

Bloom samples are sent directly to ESF or Stony Brook

How samples are processed (ESF)

Shoreline Bloom samples

- Microscopic Exam
- FluoroProbe (%BGA initially)
- Lyophilize 100ml

Total cyanotoxins:



- Microcystins (16 congeners)
- Anatoxin-a (6 congeners)
- Cylindrospermopsins (2)
- BMAA
- PSP toxins (future)

Open water filters

- “*In vivo*” chl /PC (UFI) from raw water vial
- Filter vial color coded for triaging
- Filter extracted (ESF)

Raw open water sample vial

- FluoroProbe (%BGA)
- Microscopic exam

Breakdown of NYS Surveillance and Monitoring

Category	Visual- Public	Visual- Professional	Sampling- Microscopic	Sampling- Analytical	Sampling- Toxins
Description	Digital images or comparison to image gallery	Beach manager visual evidence of BGA bloom	Microscopic scan of dominant taxa	Unextracted or extracted chl.a, phycocyanin	Lab PPIA/ELISA or field ELISA
Implication	DEC Web Notification-Suspicious	DOH/OPRHP Beach Closure	DEC Web Notification-Confirmed w/ evidence bloom	DEC Web Notification-Confirmed	DEC Web Notification-Confirmed / High Toxins
Decision Trigger	DEC review	DOH/OPRHP review	BGA / toxin producer ID	BG chl.a > 25-30; or PC > 50 & tChl > 30	MC-LR > 20 ug/l (> 10 ug/l open water)
Timing	Immediate (same day DEC review if needed)	Immediate	1-2d (transit-immediate analysis/report)	1-2d (transit-immediate analysis/report)	2-10d (transit + extraction)
Accuracy	Low to mod	Mod to high?	High	Mod to high	Mod to high
Cost	None	None	Low to mod	Mod	Mod to high
Expertise / Availability	None required	"Regulated" sites only	Few labs	Some labs	Few labs

We have all this data... now what?

“Suspicious”

- credible evidence indicates likelihood of both BGA and bloom conditions from visual, field report, other
- not (yet) verified by laboratory analysis

“Confirmed”

- BGA bloom confirmed by some combination of algae densities (chlorophyll)
- dominance by BGA (fluoroprobe, microscopics)
- toxins above WHO “moderate risk” threshold

Now what...continued

“Confirmed with high toxins”

- BGA bloom with microcystis-LR > WHO “high risk” threshold (20 ug/l shoreline, 10 ug/l open water)

For ALL categories, public advised to

- Avoid direct exposure to surface scums or heavily discolored water
- Keep pets and kids out of the water or accumulated shoreline scums
- Seek immediate medical assistance for symptoms consistent with BGA exposure
- Report any symptoms to local/state Health Department
- Report additional and on-going blooms to DEC through visual images, web page forms



Analysis: How we make “the call”

Surveillance--visual

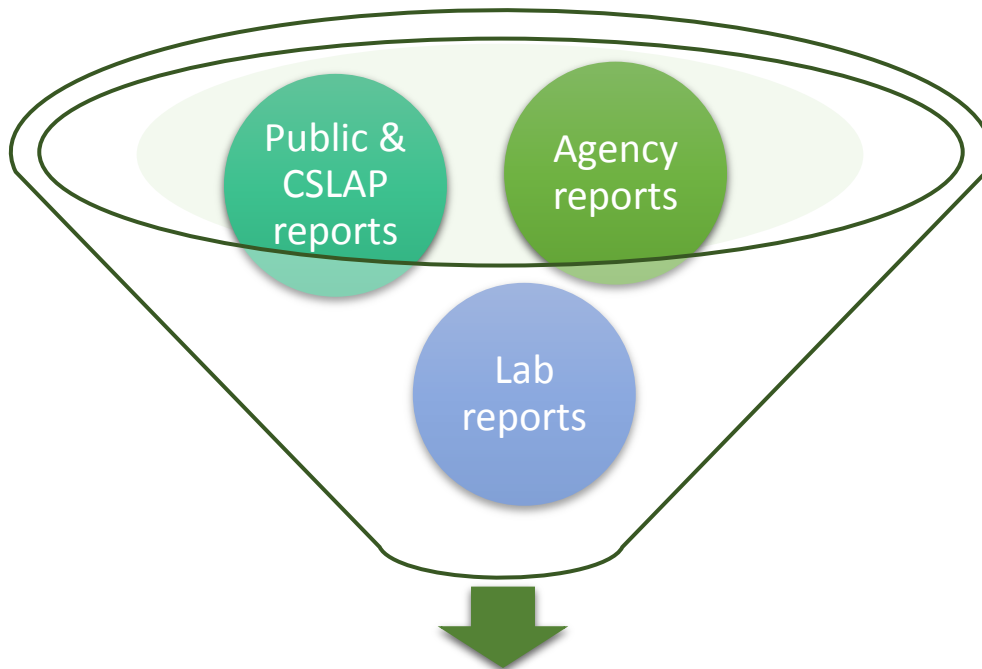
- Does it look like spilled paint, pea soup, green streaks, or (many) green dots/clumps?
- Is it small (localized), large (localized), widespread, or open water?
- Is there visual evidence of a BGA bloom (quantities)?

Monitoring--data

World Health Organization guidelines to define risk for
BGA blooms: cell counts, chlorophyll a, species ID
toxins: microcystin-LR

NYSDOH beach re-opening

A typical day and week (any/every day)



Interpret and
communicate results

Outreach and Reporting: Many days, many ways

To the sampler/"reporter"/lake association

To other agencies

To the public

To the media

By emails

By web notification

By social media

Data rich

Summary information only



Key points conveyed to samplers /“reporters”/public:

Characterization of sample/report

Suspicious, Confirmed, Confirmed with high toxins, no BGA

Small localized, large localized, widespread, open water

Next steps

Agency response

Monitoring (if none to date or follow up) response

What they should do

- Avoid exposure

- Report symptoms consistent with BGA exposure to local and state DOH

- Seek medical assistance as needed

- Forward info to other lake residents

Expectations for them

- Send images and field report if not already provided

- Keep agencies apprised of conditions

Inform them report will forwarded to others

- Local DOH/DEC



Outreach to Agencies: Email to county group

Forward all information- images, field report, lab results

Indication of lake uses

Public/private beaches or non regulated contact recreation

Public water supply

Location and extent of bloom

Sample location and/or affect shoreline/open water

Extent: Small/large localized, widespread, open water

Characterization of sample/report

Suspicious, Confirmed, Confirmed with high toxins, no BGA

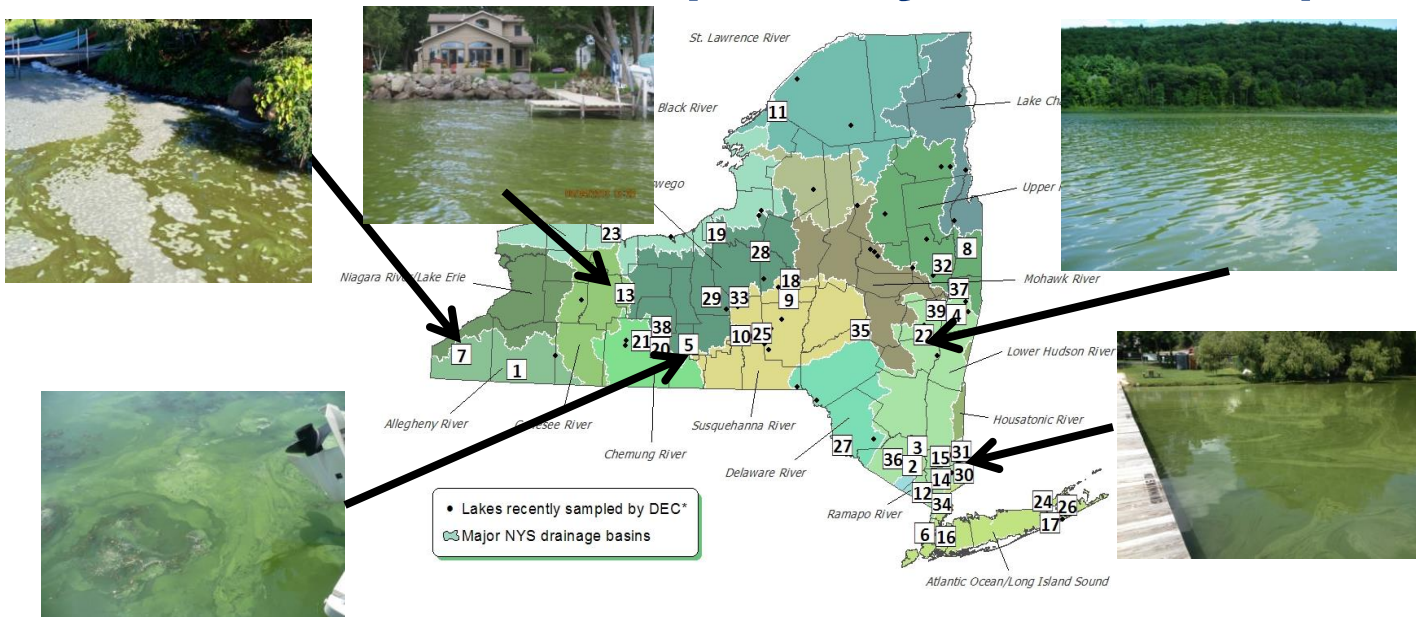
Comparison to Agency criteria used to characterize

Report forwarded to others

Lake association



Web notification (Friday outreach)



Waterbodies with Blue-Green Algae Notices

Map Number	Waterbody Name	County	Status	Extent of bloom	Status Date	Type of Sample	Change in Status
1	Allegheny Reservoir+	Cattaraugus	Confirmed	Large localized	10/7/2013	Lab sample	Updated listing
2	Beaver Dam Lake	Orange	Confirmed	Small localized	10/7/2013	Lab sample	Updated listing
3	Browns Pond	Orange	Suspicious	Widespread	10/3/2013	Visual	No change
4	Burden Lake	Rensselaer	Confirmed	Small localized	9/29/2013	Lab sample	No change

Outreach platforms: New and old tools

Media

- Web page/ notification
- ListServe/MakingWaves
- Facebook
- Flickr
- YouTube
- Twitter
- Conservationist
- Flyers/brochures

Press releases Signage



Examples of blue-green algae signs available from your local health department

Department of Health

Information for a Healthy New York

You are Here: Home Page > Swimming Pools / Bathing Beaches / Recreational Aquatics / Spray Grounds >

Blue-Green Algae Bloom Response for Beach Operator

- Blue-Green Algae Bloom Response for Beach Operators and Staff is available in Portal

Operator Action Steps

These instructions are for beach operators and staff to help protect patrons from potential

- Monitor beach areas for blue-green algae.
- Contact the local health department if blue-green algae is suspected.
- Close swim area and post signs to prohibit wading and swimming if suspicious algae is present.
- Post advisory signs if blooms are observed outside of the swim area.
- Inform staff when suspicious blooms are present, when the swimming area is closed.
- Report symptoms of blue-green algae exposure to the local health department.

What is blue-green algae?

Blue-green algae



Division of Environmental Conservation

Want to prevent your local waterbody from looking like that? One of the factors that increase the likelihood of a blue-green algae bloom is excess nutrients (phosphorus and nitrogen). Learn how you can help reduce the amount of nitrogen entering your waterbody.

Learn more about blue-green algae and how to report suspected blooms to DEC: <http://dm.ny.gov/dec>



The Division of Water has posted new announcements on its webpage. Go to the Division of Water's website (www.dec.ny.gov/about/6611.htm) to read the latest information.

Summary of What's New:

- Drug Enforcement Administration to Collect Prescription Drugs: The federal Drug Enforcement Administration (DEA) will conduct a nationwide prescription drug collection on Saturday, April 26, 2014. Collections will be held at many locations around New York and are the best way to remove unwanted prescription drugs.

In addition to the DEA collection on April 26, other collections are scheduled in many areas. Many are available more often than the DEA collection. Visit www.dea.gov for more information.



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Blue-green Harmful Algae Blooms (BAGB)
Harmful blue-green algae blooms (BAGB) are a growing concern for anglers and the general public. These blooms can cause skin irritation, allergic reactions, and other health problems. They can also harm fish and other aquatic life. The Division of Environmental Conservation is working to reduce the risk of BAGB by promoting best management practices for agriculture and urban areas. For more information, visit www.dec.ny.gov/dec/6611.htm.

Data Integration

Numeric nutrient criteria

- Defining “what is a bloom”

- Defining acceptable frequency of blooms

- Linking shoreline blooms to open water chl.a and TP

- Linking toxin production to open water chl.a and TP

Waterbody assessments

TMDL visioning (Clean Water Plans)

Technical advice for local management of blooms

- Individual shoreline/property management (septics, buffers)

- In-lake management



Research/unanswered questions (of many)

What is the definition of a bloom (visually, quantitatively,...)?

What is the most appropriate regulatory (assessment, management, permitting) threshold for preventing blooms in the majority of NYS waterbodies?

Why are some waterbodies below this threshold (still) exhibiting blooms?

What HAB screening tools provide the best opportunities for balancing public protection with an abundance of false positive reports?

What management actions should be considered for responding to BGA blooms, and should these actions be tempered by the presence of cyanotoxins?

Should there be restrictions on the management of active blooms with algacides?



Program administration/oversight

Staff time

DEC- appx 1 work year; 50% of one staff person, balance split amongst multiple staff Albany/regional DEC

DOH- appx. 3-5 work years?; 100% one research fellow, 25-50% time 4-6 staff; 2 workyears regional/local DOH

Funding

Soft money thru EPA grants

Outreach support

Web page updates- EXTREMELY HECTIC Fridays

Requires coordination among multiple groups



What we've learned--where and why in a table

Region	# 13-14 Sample d Lakes	# 13-14 HAB Lakes	2014 avg TP HABs Lakes	2014 avg TP non - HABs Lakes	# Lakes w/ High Toxins
Western and Finger Lakes	37	24	46 ug/l	18 ug/l	7
Downstate and Long Island	95	66	45 ug/l	21 ug/l	27
Central	113	51	44 ug/l	16 ug/l	15
Adirondacks (region)	86	10	24 ug/l	9 ug/l	2

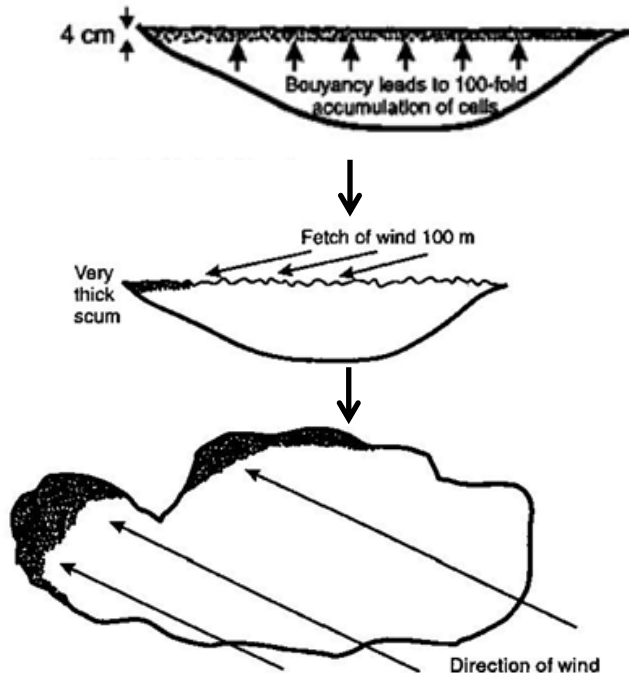
Change from year to year- things getting better?

Less Algae and Fewer blooms in 2014?

Year	Open N	AvgTChl Open	%TChl>50 Open	AvgBG Open	%BG>30 Open	AvgMC Open	%MC>4 Open
2014	902	7.8	2%	3.7	3%	0.2	0%
2013	905	16.9	3%	7.4	5%	0.5	2%
2012	650	15.1	2%	9.4	2%	0.5	2%

Year	Shore N	AvgTChl Shore	%TChl>50 Shore	AvgBG Shore	%BG>30 Shore	AvgMC Shore	%MC>4 Shore
2014	460	5492	45%	5370	44%	35	13%
2013	473	3471	43%	3166	43%	144	29%
2012	79	3482	72%	3378	59%	96	35%

Be careful of wind concentrated scums



2011-14 CSLAP

Open water samples

- 2460 samples
- 3% BGA blooms
- <1% high toxins

"Bloom" Samples

- 1010 samples
- 65% BGA blooms
- >23% high toxins

What about where people swim (shoreline BGA)?

Type	N	FP_TChl	FP_BGChl	MC
Spilled Paint	72	22824	22604	381.1
Pea Soup	67	19379	19076	165.9
Green Streaks	62	3177	3055	131.1
Green Dots	95	1635	1460	66.3
Any of last 4	224	8875	8676	129.3
Bubbling Scums	15	1580	1306	1.7
Discolored	5	228	207	48.7
Duckweed	3	210	59	185.3
Other	9	392	139	2.0
Any of last 4	51	600	459	19.9
No blooms	12	65	42	23.1

Wow! HUGE numbers!

?

Must be mis ID

(or lurking BGA)

Apparent very high total and BGA levels and toxins in all samples

Some “non” BGA image samples show higher total algae (bubbling scums), higher toxins (“duckweed”)

Which toxins? (2014)

Hepatotoxins

Microcystin-LR	N	% Detectable	% > 4ug/l	% > 20ug/l
Open	966	6%	3%	1%
Shore	453	17%	13%	9%

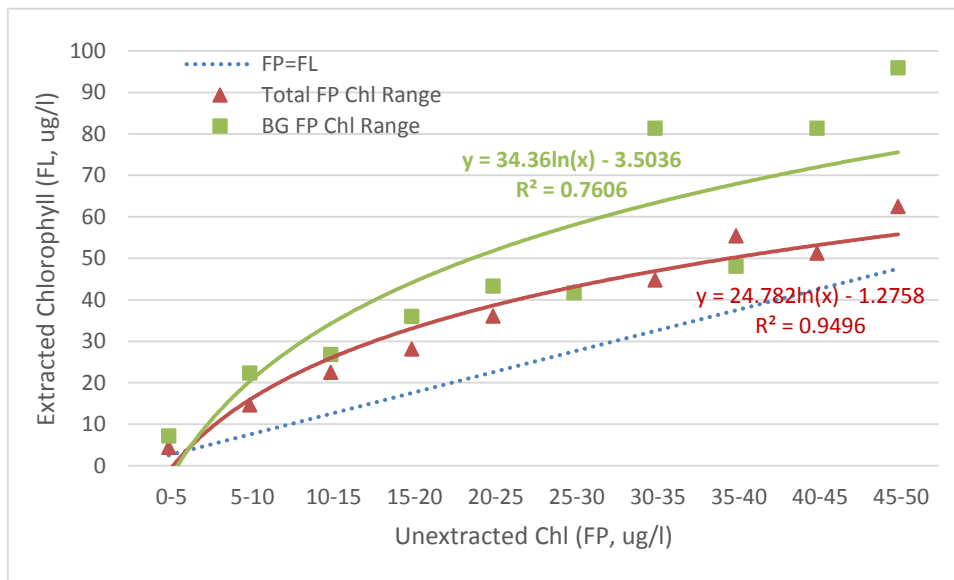
Cylindrospermopsin	N	% Detectable	% > 6ug/l
Open	923	0%	0%
Shore	447	0%	0%

d-Cylindrospermopsin	N	% Detectable	% > 6ug/l
Open	923	0%	0%
Shore	447	0%	0%

Neurotoxins

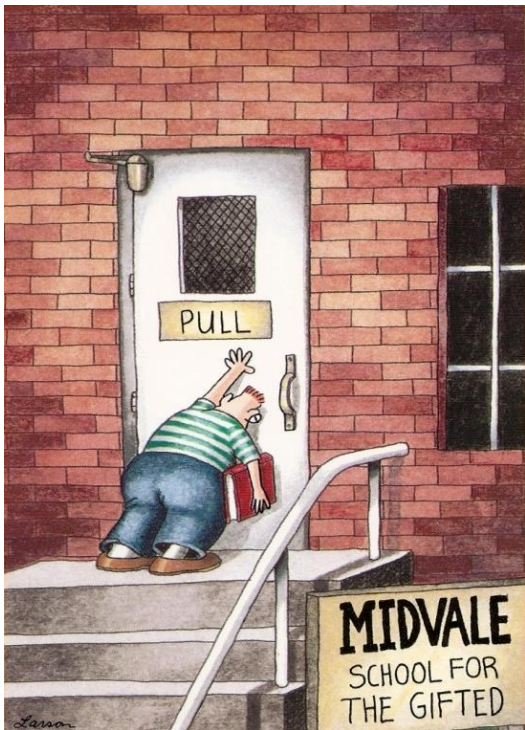
Anatoxin-a	N	% Detectable	% > 1ug/l	% > 4ug/l
Open	924	1%	0%	0%
Shore	447	6%	1%	0%

Unextracted vs. extracted chlorophyll



Fluoroprobe underestimates actual (extracted) chlorophyll
 Extracted threshold of 50 ug/l = unextracted of 35-40 ug/l

Pushback



Public

Notification impact to tourism, property values

Inconsistent bloom reporting

Fear of recreating or living near cited lakes

“Okay...we have a bloom. What will you do about it?”

Agencies

Numeric BGA bloom definition \neq visual BGA
some beaches

Dissuading some lake uses (fishing, boating)

Uncertainty about public messaging and
correct response

Next steps

HAB coordinator hired September 15th!!!!

Identify and implement sustainable funding sources

Dig through all of this data

Modify messaging- improve broad and site specific outreach

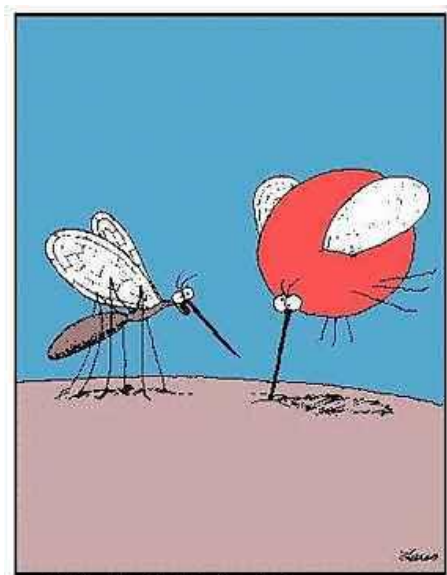
Expand surveillance and monitoring framework to more lakes

Direct more management programs to HAB waterbodies

Evaluate in-lake management tools for expanded toolbox



Lessons for others



"Pull out, Betty! Pull out! ... You've hit an artery!"

Messaging and goals- matching info stream to data needs

Continually refine goals- can outreach keep up with input?

Build program around existing and sustainable tools

Dedicated staff needed- takes more time than you think

Meeting expectations- be prepared for "what next" questions

Anticipate curveballs to avoid ad hoc responses in real time

Questions?



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